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THE ADOPTION OF INFORMATION & COMMUNICATION TECHNOLOGY IN MANAGING SUPPLY CHAIN INTEGRATION

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Abstract:
Due to rising demand and supply disruptions, supply chain operations have adopted information and communication technologies more frequently in recent years. The purpose of this article is to evaluate the degree of ICT adoption and the approaches taken in the processing business. The paper adopts a mixed approach including 259 respondents involved in a survey investigating the extent of ICT adoption in the processing industries and 8 top-level staff of the focal firm tangled in an individual interview to reveal the strategies used in ICT adoption.
Taken together, the results show an improvement in the processing industry in ICT adoption. The results indicate that most of the focal firms are in the second phase of ICT adoption called the implementation phase while the most dominant strategies used in adoption include capacity development, building strategic partnerships and firm restructuring. For the focal firm to fully benefit from ICT adoption in operations and organizational performance, the focal firm must make improvements, including involving all stakeholders in their effort to digitalize supply chain operations. Meanwhile, other participants in the production of dairy products in Tanzania and elsewhere need to understand the significance of ICT adoption and SCI as well as the advantages they can all derive from this engagement. The study shed new light on the effective strategies that can be employed to enable the effective adoption of ICT to improve the performance of the entire supply chain. These results add to the rapidly expanding ICT adoption in the processing industry and other related industries.

Keywords:
Adoption, Information & Communication Technology, Supply Chain Integration, Processing Industry

1. Introduction

1.1. Background information on ICT adoption and SCI

In recent years, many organizations have adopted ICT to improve firms' business and performance (Albar and Hoque, 2019). The need to employ ICT has currently extended due to the increasing volatility of demand and supply (Shiralkar et al., 2021) and other social unrest including the Covid-19 pandemic (Sallwa, 2023). The most common factors contributing to this adoption include the need to minimize operational costs and improve SC operations (Yao et al., 2022). Other factors revealed by Yang et al., (2021) include operational, strategic, and customer needs, the influence of supply chain partners and competition. The improvements in these driving factors have led to the improving need to demand improved technologies such as the Internet of Things (IoT), blockchain technologies, cloud computing and wireless sensor networks (Saurabh and Dey (2021). These drivers have also compelled many African-based firms to adopt ICT, as reported by Ayim et al., (2022) who assessed the ICT adoption in African agriculture.

The adoption of ICT in business operations and SCM has always been in motion as ICT technologies keep changing and improving (Som et al., 2019). In the Tanzania supply chain, the adoption has now taken part as the demand to automate the supply chain has increased over the days (Kabelele and Musabila, 2020). Albukhitan (2020) conducted a similar study in the manufacturing sector in Saudi Arabia. The study aimed to understand the extent of ICT adoption and the way forward. It was revealed that ICT adoption passes through three levels; the adoption of new technologies, the phase of investing in tools, and the upgrading of existing systems (Albukhitan, 2020). The naming of the phases was different, but the meaning was much like that of Dixit et al., (2021). Albukhitan (2020) concluded

that, for a firm to maintain a competitive advantage, a digital transformation strategy is essential, as it will enable the firm to respond to changes while focusing on the future and how to get there.
The evolution of the supply chain is much attributed to the evolution of ICT (Yao et al., 2022; Yang et al., 2021). The increasing development in supply chain management (SCM) has been influenced by the increasing improvement in digital technologies Albar and Hoque, 2019). This trend has attracted research interest in the adoption of ICT in the manufacturing sector (Dixit et al., 2021). Many current studies have shown that firms' business operations efficiency has improved (Saurabh and Dey, 2021), resilience, and robustness (Yang et al., 2021). The benefits have also been realized in Africa as reported by Kayanda et al., (2020) in improving the efficiency of the supply chain by improving actors' reliability and connectedness and increasing innovation and sustainability in the value chain (Mwantimwa, 2019). However, in many African countries like Tanzania, firms have been maximizing their resources to enable effective adoption despite the uncertainties on the best strategies to use (Mushi et al., 2022). Firms have been struggling with ICT adoption to reap the revealed benefits in business performance (Mwantimwa, 2019). Supply chain managers are currently considering the best approaches to fit the internal operations of their organizations to the adoption pace (Ngongo, 2019). To better understand this occurrence, the following two research questions (RQ) will be addressed in this work.
RQ1: To what extent has the processing industry adopted ICT in managing supply chain integration?
RQ2: How is ICT adopted in the processing industry's supply chain operations?

1.2. Significance of the Study
The study covers the empirical gap shown by revealing the extent of ICT adoption in processing firms to help supply chain actors realize their pace of integrating supply chain operations through ICT. The study also reveals strategies used in adopting ICT in the dairy supply chain so that all members involved to adapt the adoption and strengthen the supply chain network of the dairy industry.

2. Literature review
2.1. Resource-based view (RBV)
The resource-based view (RBV) theory views inter and intra-firm relations as vital resources that can be used to generate value for stakeholders (Freeman et al., 2021). The RBV contemplates intangible resources as important in achieving competitive advantages as firms can form, mobilize and utilize strategic plans and resources in value creation and value deliverance to customers (Freeman et al., 2021). The resource-based view theory considers that supply chain integration provides firms with the ability to access important resources owned by other supply chain actors in the chain and link them to work together in value creation and delivery to achieve the goods of each partner and the holistic network goals (Freeman et al., 2021).
The relevance of RBV in this study is shown in the aspect that, a single firm does not necessarily have to own all relevant strategic resources and channels for it to win in meeting customers' needs, rather it needs to have access to all the needed resources by making integration with other supply chain actors in the respective supply chain (Khanuja and Jain, 2019). This is only possible with ICT adoption, as supply chain members will be connected and linked in operations to serve the upstream and downstream value to the customer (Shiralkar et al., 2021). RBV considers different determinants and enablers of strong supply chain networks including ICT adoption and information systems, in particular, firm-level factors (management-based factors), the firm's position and structure, and environmental factors (Yao et al., (2022). This comes as it is very hard for a single firm to possess all needed resources, abilities, and qualities needed to enable it to sustain a competitive advantage in the long run (Frederico et al., 2019).

2.2. Empirical evidence on the extent of ICT
2.2.1. The extent to which ICT is adopted in supply chain operations
The extent of ICT adoption is different from one country to another and from one industry to another. For instance, in the Italian manufacturing industry, the adoption of ICT has passed all the levels and reached the sustainability level of implementing Industry 4.0 (I4.0) (Braccini and Margherita, 2018). At this level, the emphasis is on improving productivity and quality of products, continuous energy consumption, monitoring, and a less intense workload. All these are achievable through integrating new technologies, including the Internet of Things (IoT) and artificial

intelligence (AI), throughout the firm's operations (Braccini and Margherita, 2018). The study reveals the situation in many developing nations, which is a bit different from developing countries. The debate over ICT adoption is extremely broad, as each study emphasizes the adoption extent of the relevant area of study, leaving global adoption uncertain (Dixit et al., 2021). For instance, in examining the adoption of ICT in the Indian environmental sector, Dixit et al., (2021) identified three levels of adoption: the inception phase, where ICT is introduced first, the implementation phase, when the facets of ICT are kept in use, and the extended phase, where ICT is improved to match the new emerging needs of the relative company or sector (Dixit et al., 2021). The study highlighted several attributes that facilitate the adoption; including perceived benefits (such as excelling communication, enhanced decision making, reduced work errors, better information storage, and refinement of productivity) and perceived enablers (IT support, compatibility of the ICT platform, education regarding ICT and software, a user-friendly system, and risk-free adoption).

However, ICT adoption also depends on the relative technology adopted, for example the adoption of Industry 4.0 technologies (I4.0) is not as smooth as one can imagine; the process faces some barriers (Raj et al., 2019). High investment in I4.0, a lack of clarity about economic benefits, challenges in integrating the value chain, security breaches and risks, inequality, a lack of digital skills and infrastructure, and a lack of standards, regulations, and forms of certification are among the common barriers (Raj et al., 2019).

Ghobakhloo et al. (2012) also identified three levels of ICT adoption among Malaysian SMEs without concerning a specific technology. The process starts with the initial adoption stage, where IT requirements analysis is expected to be conducted, IT services and products are expected to be acquired, and organizational readiness is expected to be communicated to all relevant stakeholders both internally and externally. The second level is the implementation stage, where the ICT is deployed to translate the decision to adopt into reality. This stage needs all supply chain actors to work together to succeed (Ghobakhloo et al., 2012). The final level is the post-adoption stage, where system evaluation should be thorough and system upgrades should be frequent to accommodate all the changing and emerging needs (Ghobakhloo et al., 2012).

The studies above reveal different levels of ICT adoption that many competitive industries and sectors adopt. Despite environmental and technological differences, Tanzania's manufacturing and processing sector is striving to attain the same levels as today (Ayim et al., 2022). The above studies have not shown the extent of adoption of ICT within processing industries or how well to implement and improve the process in terms of developing countries like Tanzania. This study has investigated the ICT-enabled communication used, ICT decision support employed, ICT technologies adopted in implementing the integration and enterprise systems, and business-to-business interactions witnessed within the processing industries (Som et al., 2019: Yang et al., 2021). The assessment of this has enabled the study to identify the phase the adoption reached by processing industries in Tanzania.

2.2.2. Strategies used to enable the adoption of ICT on supply chain operations at the Dairy processing firms

The adoption of ICT is enabled by the strategies that the firm has opted to use (Gono et al., 2016). This study has explored different strategies used to enable the adoption of ICT on SC integration in the manufacturing sector such as training staff on the newly adopted technology and restructuring of the firm's operations. These strategies will help managers and supply chain experts to better improve the strategies for ease of adoption. Other strategies such as firm restructuring and creating strategic partnerships were also captured in the study of Ayim et al., (2022) when investigating ICT adoption in the African agriculture sector. The two techniques are highly employed when the adoption is very certain and well planned to create and sustainable long-term performance of the entire supply chain.

A similar study by Alazab et al., (2020) revealed similar strategies and added digital transformation to the list. This study was guided by the UTAUT model and revealed several factors that influenced the adoption of blockchain technology in SC management, which include user satisfaction, performance expectancy, effort expectancy, social influence, and facilitating conditions. Alazab et al., (2020) omitted the four confounding factors identified by Venkatesh et al., (2003) on the UTAUT model and added technology trust and inter-organizational trust. Based on the model, the study concluded that the best strategy for blockchain adoption among SMEs will be one that considers all of the facilitating factors mentioned.

A digital transformation strategy for the manufacturing sector is vital and essential for the sustainability of SMEs (Alzab et al., 2020). Albukhitan (2020) elaborated on how to develop a digital transformation strategy to ensure the firm's competitiveness. For a firm to remain competitive, it should expect and be ready for changes as it innovates

itself. Digital transformation enables firms to plan and be designers of their future business operations (Albukhitan, 2020). The development stages of implementing a digital transformation strategy include creating a transformed digital vision and objectives, assessing the firm's digital capability, designing the user and staff experience, selecting solutions and vendors, and forming the roadmap for implementation.

In identifying the strategies used by South Africa's SMEs in adopting ICT in their business operations, Gono et al., (2016) revealed that the most used strategies were restructuring of firms' operations, developing staff capacity, and compatibility of the information system with the business operating environment. Gono et al., (2016) revealed several benefits of doing this, including reducing costs of operations, increasing productivity, improving work efficiency, and improving supply chain interconnectedness.

Having seen all these strategies, this study revealed the strategies used in the processing industry in Tanzania in the adoption of ICT. This serves as a base regarding ICT adoption in processing industries of developing countries like Tanzania. To achieve this, the study assessed the firm's agreed vision of ICT adoption and usage, the level of information quality of the firm, supply strategic partnership, information sharing policies, and customer relation management (Saurabh and Dey, 2021). Furthermore, the study assessed the firm's structure, staff capacity, and transformation of business operations (Alzab et al., 2020).

3. Data and Methods

3.1. Area of the Study

The study was conducted in the Iringa region in Tanzania (covering Iringa rural, Iringa urban, and Mafinga districts) and it involved different respondents such as employees in the fields of procurement, supply chain, and managerial level, suppliers, and customers working with ASAS Dairies Ltd which is headquartered in the respective region. The reasons the researcher chose ASAS Dairies include the experience of the firm in the processing industry, the dominance the company has on supply chain integration and the width of the respective integration. It is believed that this entity has enriched the study with all relevant information to allow a clear view and objective analysis of the studied phenomenon.

3.2. Research Design

This study adopted a cross-sectional design (data was gathered and collected only once throughout the study) at ASAS diaries and its supply chain partners to allow an overall analysis of how ICT is adopted in managing supply chain integration. The study combined two approaches, the quantitative and qualitative approaches.

3.3. Quantitative Approach

This approach was adopted to fulfill the first objective of identifying the extent of ICT adoption at the focal firm from the perspectives of the focal firm's staff, customers, and suppliers.

3.3.1. Population and Sampling

This part involved 259 respondents identified by the focal firm, comprising 64 staff of the company, 78 integrated suppliers, 64 integrated customers, and 53 integrated distributors who all together have working contracts with the focal firm. To enable a holistic view of all the supply chain actors, all 259 respondents were included; hence sampling was not ideal.

3.3.2. Data Collection

Data was collected through well-designed questionnaires that were formulated to capture first the extent of ICT adoption using the 5-point Likert scale to validate 7 statements that were dedicated to the focal firm's staff. The second part of the questionnaire captured other variable information on the extent of ICT adaptation using 4 criteria that were dedicated to all 259 representative members of the dairy supply chain. The questionnaires were available in the Kobo toolbox and data collection was administered by the researcher through the ODK collect for ease management of data and time.

3.3.3. Validity and Reliability

To ensure face validity, the used questionnaire was well-designed and derived from established models, theories, and empirical research. Also, by including all of the contents of the variables that were the subject of the research, the researcher made sure that the questionnaires had content validity. The used scale's internal consistency was evaluated using Cronbach's alpha. Each latent variable's and the aggregate score's Cronbach's alpha score must be more than 0.70 for the data to be considered credible (Collier, 2020). According to the results, the overall Cronbach's alpha score was 0.882. To assure the consistency of the collected results, the researcher also made sure study participants were aware of and familiar with the phenomena and factors investigated.

3.3.4. Data Analysis

This objective was analyzed using normal descriptive statistics (mean and standard deviation) for the first part of the questionnaire and crosstab for the second part. This approach gives a clear view of all the responses and perceptions of the respective supply chain actors.

3.4. Qualitative Approach

The purpose of this approach was to answer the second question of exploring the strategies used to enable the adoption of ICT in the supply chain integration of the processing industry.

3.4.1. Population

In answering this objective, the study involved all eight (8) managers of the focal firm who are more involved in ICT adoption at the firm's supply chain purposively to identify the strategies used in adopting ICT in managing supply chain integration. The managers include a procurement manager, supplier development manager, operation manager, sales and marketing manager, transport and logistics head, distribution head, quality assurance manager, and customer relations manager.

3.4.2. Sampling and Sample Size

Due to the number of respondents identified and the intended richness of the details needed, the study involved all eight managers; hence no sampling technic nor sample size was used.

3.4.3. Data Collection Technique

Individual interviews were conducted to enable data collection on the respective objective. The interviews were semi-structured to allow standardisation of the data collection process and comparability of the respondents' responses. The interview questions were adopted from Alazab et al., (2020): and Albukhitan (2020) who all studied the strategies used in adapting ICT in supply chain integration.

3.4.4. Credibility and Trustworthiness

To ensure the credibility and trustworthiness of the data collected, the interview was guided by a well-developed guide that allowed uniform questions to all the respondents to show the question trail of the interview. The researcher ensured the respondents to be involved in the study were those who were familiar with the studied phenomenon. Also, triangulation involving the observation method and a comparison between the collected data and other current studies adds credibility and trustworthiness to the data collected.

3.4.5. Data Analysis

Thematic analysis was applied to identify and narrate the key strategies used to adopt ICT within the focal firm and the integrated actors. Thematic analysis was conducted on the base of the following steps; first, the researcher familiarized himself with the data, generated initial codes, searched and reviewed the themes, and narrated them (Kiger and Varpio, 2020). Data collected were then transcribed by the researcher to allow a uniform analysis of the data and consistency in interpreting the results to answer the study's objective.

4. Findings and Discussions

4.1. Findings of Objective One: Extent of ICT Adoption in the processing industry in managing supply chain integration

To analyze the extent of ICT adoption in the processing industry, the researcher adopted questions from several different studies that revealed the adoption phase that ASAS is currently in; the ICT usage frequency, the ICT and information systems used, and the appropriative skills involved. The findings involve descriptive statistics as generated after a descriptive analysis of the data collected as revealed next.

4.1.1. ICT adoption extent at ASAS (focal firm).

In first analyzing the phase that the ICT adoption that has taken place at the focal firm, seven statements were used to enable respondents (focal firm's staff) to identify the situation ASAS is currently in. The findings presented by using mean and standard deviation (see Table 1) revealed that ICT adoption has been regular at ASAS dairies as its mean score was 4.00 and SD was 0.723. The extent of ICT adoption was also evidenced by the presence of customer integration that depends on the implemented ICT adopted technologies at the firm (mean = 3.96 and SD = 0.634). Apart from adopting ICT facets, it was revealed that; ASAS dairies have already started the upgrading process of some of the adopted systems as shown by variable item ADP 5 with a mean score of 3.86 and SD of 0.666. These findings show that the focal firm is in the implementation phase, as in this stage the dependability on the adopted technologies is high and the investment in ICT features keeps increasing (Albukhitan, 2020). ASAS also shows the need to move to a further stage as shown by the upgrading structures that take place to respond to the changing business environment and increase the performance of the whole firm (Braccini and Margherita, 2018).

Table 1: The extent of ICT adoption in Supply Chain Management

Variable item	Statement	Mean	Std. Deviation
ADP6	The extension of the adopted ICT has been a regular	4.00	.723
ADP7	Customer integration now depends on the adopted ICT	3.96	.634
ADP5	Several information systems have been adopted and upgraded to counter the current supply chain needs	3.86	.666
ADP3	ICT adoption has improved ASAS' internal operations	3.80	.734
ADP4	The supply chain integration has been simplified and improved as a result of ICT adoption	3.80	.662
ADP2	We were involved from the inception stage of adoption until now	3.66	.722
ADP1	We rely on the adopted ICT in our operations	3.64	.715
Valid N (listwise)	64		

4.1.2. Frequency of using ICT systems along the supply chain.

To understand the extent of ICT adoption, the researcher assessed the frequency of use. It was revealed that the adopted ICT systems are used daily as (40.9%, n= 106) of respondents backed this statement followed by (33.2%, n=86) who responded to periodic usage. Furthermore, the difference between the four supply chain actors in using ICT systems is significant as shown by sig. value of 0.000 generated from the Chi-square test. This implies that ASAS (focal firm) actors frequently use the systems way more than other supply chain actors.

Table 2: Frequency of use

Crosstab	Everyday	Periodically	Specific situations	It depends	Total
Focal firm	48	11	4	2	65
Suppliers	16	28	28	6	78
Distributors	15	21	12	5	53

Customers	27	26	5	5	63
Total	106	86	49	18	259

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	58.438[a]	9	.000

a. 3 cells (18.8%) have expected count less than 5. The minimum expected count is 5.68.

4.1.3. ICT systems used by ASAS and its partners along the supply chain.

In this part, the researcher aimed to reveal the ICT systems that the focal firm and other supply chain actors use to integrate their activities in delivering value throughout the chain. Findings show that Sage X3 (34%, n=88) and SAP system (25.1%, n=65) are much used along the supply chain as the two systems integrate several functions (such as finance and accounting, production, human resources, logistics, and others) within a firm and share the summary details with other stakeholders. Interestingly, the systems were much used by the focal firm (n=32 on Sage X3 and n= 25 on SAP), and the difference in usage between the groups was significant as revealed by the Chi-square test (sig. value = 0.000). To evidence that the adoption is still in progress, 22.4% (n= 58) of respondents declared their non-usage situation.

Table 3: ICT systems mostly used

Crosstab	**Sage X3**	**SAP**	**None**	**IFS**	**Net Suite**	**Social Media**	**Odoo**	**Syspro**	**Total**
Focal firm	32	25	4	1	0	2	1	0	65
Suppliers	8	26	30	4	6	3	0	1	78
Distributors	18	12	16	0	0	3	4	0	53
Customers	30	2	8	18	3	0	0	2	63
Total	88	65	58	23	9	8	5	3	259

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	124.513a	21	.000

a. 2 cells (3.1%) have an expected count less than 5. The minimum expected count is 9.61.

4.1.4. Needed skills in using the ICT systems

The researcher also assessed the needed skills to engage and use the adopted ICT systems as per the perspective of the respondents to understand why some are not still using the systems. Findings revealed two major groups (basic computer skills and advanced ICT skills). 56.4 percent of respondents (n= 146) within which 43 of them were suppliers believe one only needs to have the basic computer skills to adopt the systems while the rest 43.6 percent believe that the basic skills are not sufficient, one needs to have ICT advanced skills to use the systems effectively. However, the Chi-square tests suggest the differences in this view were insignificant (sig. value = 0.232).

Table 4: The needed skills

Crosstab	Basic Computer Skills	ICT advanced skills	Total
Focal firm	41	24	65
Suppliers	43	35	78
Distributors	24	29	53
Customers	38	25	63
Total	146	113	259

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.286a	3	.232

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.12.

4.1.5. The capacity of involved staff in terms of skills

In the final part of this objective, the study was interested in assessing the current skills and capacity of staff of the focal firm and its partners' staff in implementing the adopted ICT systems. Findings reveal that the majority of the staff have the complete needed skills in using the adopted ICT systems (46.3%, n= 120) within which 37.5% of those are from the focal firm. This difference in staff capacity among the ASAS dairy supply chain was significant as shown by the Chi-square test (sig. value = 0.000).

Table 5: Capacity of Supply Chain Staff

Crosstab	Yes, they do	Somehow, they do	No, they don't	I don't know	Total
Focal firm	45	18	1	1	65
Suppliers	20	30	19	9	78
Distributors	18	20	9	6	53
Customers	37	19	5	2	63
Total	120	87	34	18	259

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	44.009a	9	.000

a. 3 cells (18.8%) have expected count less than 5. The minimum expected count is 5.68.

4.2. Findings of Objective Two: Strategies Used in Adopting ICT in Managing Supply Chain Integration

The involved staff in answering this research objective were managers (heads) of the departments of procurement, supplier development, operations, sales and marketing, transport and logistics, distribution, quality assurance, and customer relations. Of these eight managers, five were male and three were females who participated in the individual interview on the strategies used in adopting ICT at the focal firm. The researcher also observed some of the operations during his visit to the company as part of the triangulation of the data collected. In presenting the interview remarks, the researcher has used coded names (RI-R8) where 'R' means respondent.

4.2.1. Information communications systems used at ASAS

The researcher was able to see the user information communication systems at ASAS premises including Sage X3 and SAP. The majority of the interviewees argued that the system enables many functions such as integrating information with other users saving and storing data more securely and helping in decision-making by enabling descriptive analysis of the data involved. Other used system includes Odoo, Syspro, and IFS. RI said,

Here we mostly use Sage X3 and SAP according to our operations as it is very compatible. All users use the same language of operations and they are very simple to use.

It was also revealed that the same systems were used in integrating functions within the firm and outside the firm with partnering firms (suppliers and distributors). R4 gave the following remarks

The reason these systems are used much is that they enable both internal and external users without the urge to change data to a different platform or format, all you need to do is give access to what you need to share and block access to that information you don't need to share.

4.2.2. Frequency of Use and ICT equipment used

The researcher wanted to assess how serious the ICT adoption is at the firm by determining how frequently the systems are used and what were the enabling tools (ICT equipment). The respondents revealed that the systems were frequently used at the firm (day to day) because one of the strategies used in adopting ICT was restructuring all business operations to accommodate the changes. The only setback witnessed by the interviewees was the non-responsiveness of the suppliers and distributors they engaged with. R2 said,

Here the systems are the new way of life, without them nothing takes part. The problems are with our partners who are not willing to invest in the systems, especially the small (emerging) partners. They force us to use both, the system and manual entries to keep up the use of the systems.

The respondents revealed several pieces of equipment used by ASAS to enable the use of the system including computers (desktop and laptops), tablets, internet hubs and routers, gateways, and transceivers. The researcher was able to witness the devices by observing.

4.2.3. Relevance of ICT adoption in enabling SCI within the supply chain

During the time of data collection, ASAS was faced with production stoppage due to a lack of packing materials for the small yogurt products. This situation was caused by the untimely delivery of items from the suppliers. To understand more, the researcher asked the respondents about the relevance of ICT adoption in integrating with suppliers, customers, and internally. Respondents revealed that SCI is highly influenced by the ICT adoption but the problem is the accountability of the partnering actors of the firm. R3 said,

At first, many suppliers will use the systems since they need future contracts from us, but as they grow and be reliable, they start posing excuses from day to day justifying that they cannot use the said systems and since it's a free world, we are forced to move backward in ICT adoption process. If you sit and talk to them in a friendly manner, they agree on the importance of ICT in our engagements but they are just not ready for changes and ICT investments in their operations, so they decide to cut costs.

4.2.4. The Needed Skills and Competencies of ASAS Staff

The researcher was also interested to know if the staff involved in SCI at ASAS have the skills and competencies, needed in performing their duties well. The finding reveals, that for one to use these ICT systems, just basic computer skills can enable that. Many of these systems are developed to enable the same functions done manually to be accommodated into the systems for more time-saving simplicity in use and accommodating more functions and features. R5 said,

The entries, procedures, and output are the same, if you're a finance officer then you qualify to use SAP. But for the first time, you need guidance from someone experienced or the user guide and manuals and you are good to go.

This implies that the majority of the staff at ASAS can use the systems unlike the part of suppliers (milk suppliers) who employ unskilled workers to oversee the cows and supply milk and they possess absolutely no prior basic computer skills as argued by the respondents.

4.2.5. Strategies involved to enable ICT adoption at ASAS

This was the core of this objective, to reveal the strategies used in ICT adoption at ASAS. The respondents all together aired three strategies that were mostly used at ASAS. The first was firm restructuring (a new way of operation was enacted in the firm to enable ease of adoption of ICT). R7 said,

We knew we could face challenges from those who always oppose changes and from our old manual dealings' procedures, so we started with restructuring all our operations to allow the adoption of ICT without fear of disturbing our normal operations. With this, we can convince suppliers and customers to change along with us, as the motion shows the seriousness of the management in adopting ICT.

Another strategy employed is the strategic partnership. Since the firm still faces noncompliance from some of its suppliers and distributors, the firm has decided to form strategic partnerships where it provides short-term capacity building on the staff of its allies and continuing support on how best to use the system and ripe the benefits altogether. This was also evidenced by the researcher through his visit to the said partners during the questionnaire-filling process. Among the benefits of this strategy includes convincing our suppliers and customers how important it is to adopt ICT along the supply chain operations, this was evidenced by R8 who said,

With this investment, convincing our partners on the ICT adoption becomes easy, as the efforts are justifying everything.

Despite this method working very well with its partners, ASAS also had to use another strategy for its internal staff to enhance their abilities and reduce resistance to change. R6 elaborated by saying,

For our staff, we decided to use capacity building as a way to affect their willingness to adopt changes and their effectiveness in executing their roles using the modern ICT systems employed in the firm. The systems cost us a lot and their benefits are too much for us to discard, therefore capacity development is inevitable.

4.2.6. The Influence of ICT on SCI of the Processing Industry

The interviewees also commented positively on the influence of ICT on SCI in ASAS operations. The majority of them believe SCI could be hypothesized practice if had not been the ICT adoption in between. This implies that a manual SCI is very complex and ineffective given the modern business environment where suppliers and distributors can be those from other countries. On the part of the relevance of SCI in the dairy supply chain, respondents argued the importance of SCI in easy sharing of information, building and maintaining competitive advantage through proper time and cost management, and mitigating challenges of business uncertainties such as supply disruption and demand volatility. R7 Zaid,

With the pace of sharing information within this modern SCI (ICT enabled), firms can overcome almost every challenge in their way as options are searched and applied more quickly to counter any setback in the way of performing excellence along the supply chain.

4.2.7. Supply Chain Integration and its Influence on Supply Chain Performance

The last question in the interview guide seeks the respondents to share their views on the influence of SCI as enabled by the adopted ICT on supply chain performance. Findings from the interview imply that SCI has helped improve the performance of the entire supply chain members as interconnectedness and reliability between the supply chain members have increased. In response to this statement. R3 gave the following statement,

I cannot justify it statistically with vivid details, but I know for sure that, SCI has been a catalyst to the current performance of ASAS and the dairy supply chain at large. A lot of challenges we faced then are absent in today's operations due to SCI.

5. Discussion

This section has been organized around two main topics to make the discussion more understandable, namely:

1. The extent of ICT adoption in the dairy processing industry's supply chain operations.
2. The strategies used in ICT adoption in the dairy processing industry's supply chain operations.

5.1. The extent of ICT adoption in the processing industry's supply chain integration

The findings from 4.1.1 to 4.1.5 above also comment on the extent of ICT adoption of ASAS Davies and even show the ICT adoption environment throughout the processing industry's supply chain. It is with no doubt now, that the processing firm is still in the second stage of ICT adoption called the implementation phase as per the definition of the phases outlined by Albukhitan (2020) and Dixit et al., (2021). Despite the high motive shown by the company in

moving to the next phase (upgrading phase), the focal firm needs to strengthen the application of ICT systems within the firm and along the chain at large. The findings of the study on the features of the implementation phase are in hand with those of Braccinni and Margherita (2018) and Ghobakhloo et al., (2012). Again, the study confers with Albukhitan (2020) on the level of investment a firm needs to forward for it to move the adoption process further. Focal firms need to invest more if they need to improve the sustainability level of ICT adoption to acquire extended features such as Industry 4.0, Internet of Things (IoT), and artificial intelligence (AI). Among the reasons making the ICT adoption process of ASAS, a slow-moving process includes the segregation of supply chain actors. The focal firm only integrates with the big suppliers, distributors, and customers leaving the small ones vulnerable, as a result, the process is not maintaining the pace needed by the firm. This observation was also reported by Raj et al., (2019) when assessing the barrier facing the adoption of 14.0 technologies.

5.2. The strategies used in ICT adoption in the dairy processing industry's supply chain operations

To sum up this objective, the findings revealed three major strategies used to adopt ICT by the focal firm including firm restructuring, strategic partnership, and capacity development. These findings are compatible with those of Gono et al., (2016) and Sundram et al., (2016). The situation of ICT adoption in Africa seems to be of the same nature as Gono et al., (2016) revealed similar strategies in South African SMEs about ICT adoption. Apart from African perspectives, Sundram et al., (2016) found that one of the dominant used strategies in adopting ICT in Malaysia was strategic partnership. The findings were however different from that of Alazab et al., (2020) who revealed that firms don't usually stay long in the implementation phase of ICT adoption and they jump into the digital transformation of all their operations. At the focal firm, the situation was a bit different as since they started adopting ICT in 2009, the company has yet to consider a full digital transformation. The finding also conquers with that of Dixit et al., (2021) on the most used information communication systems in business operating environments as both studies mentioned Sage X3 and SAP applications. In analyzing the advantages of SCI in dealing with the changing business environment, the study's findings were in hand with that of Alazab et al., (2020). Both studies also revealed the relevance of ICT adoption in enabling SCI within the supply chain and term it vital in bringing firms together in the supply chain and enabling them to work as a whole in delivering value to the end customers.

6. Conclusion, Originality, and Recommendations

6.1. Conclusion

To sum up, the study was able to fulfill the intended objectives by revealing the extent of ICT adoption of the focal firm (implementation stage) and highlighting strategies used in the adoption of ICT (firm restructuring, capacity development, and strategic partnership). Before this study, it was difficult to make predictions about the strategies used in adopting ICT or the extent of ICT adoption in the processing industry. Practically, this study will improve SC actors as it enables them to understand how well to adopt ICT and improve SC interconnectedness among members.

6.2. Originality

The study shed new light on the effective strategies that can be employed to enable the effective adoption of ICT to improve the performance of the entire supply chain. These results add to the rapidly expanding ICT adoption in the dairy processing industry and other related industries. As a result, these findings will enable focal firms to improve the adaptation process for the benefit of their respective supply chains. Overall, the study was successful both practically as seen above, and theoretically as it contributes to existing knowledge of SC management by providing critical links and relationships of various variables that together can improve the SCP.

6.3. Recommendations

From the findings the first objective that shows the extent of ICT adoption, the focal firm should invest more in the adaptation process as the adoption is expected to improve even that of the other supply chain partners. The focal firms have areas of improvement including involving all stakeholders in their move to digitalize supply chain

operations as the whole network needs to adopt ICT for the focal firm to realize the full benefits of ICT adoption in operations and organizational performance.

During the interview on the second objective, respondents revealed the unwillingness of some distributors, suppliers, and customers to adopt ICT-enabled operations and be involved in supply chain integration. Members of the dairy production in Iringa and elsewhere, need to understand the importance of ICT adoption and SCI and the benefits they can each acquire from this engagement. This will help them to adopt ICT and engage in SCI with other stakeholders for the betterment of all other supply chain actors. SCI is not for the focal firm alone, it's for every actor within the chain.

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